Novel High-Speed Drilling Motor for Oil Exploration & Production

DE-FC26-04NT15501

Goal
The project goal is to design and develop a high-speed mud motor assembly, compatible with a coiled tubing drilling (CTD) system, to drill small-diameter holes for vertical, horizontal, and multilateral wells.

Performer
APS Technology Inc.
Cromwell, CT

Results
All of the subtasks of the first year's main task essentially have been completed, with the exception of the critical frequency analysis, which will continue in parallel with the laboratory testing. The manufacture of the laboratory prototype is somewhat ahead of schedule and will begin during Year 1 of the program.

Benefits
This project is intended to develop a high-speed, small-diameter drilling system, with a motor powered by drilling fluid flow and with the ability to support a CTD operation. The use of high-speed motor and bit combinations has the prospect of greatly increasing drilling rates and thereby reducing the costs of both exploration and development wells. The use of smaller-diameter bits and systems, and CTD equipment in conjunction with these systems, will further reduce drilling costs and enhance hydrocarbon recovery in environmentally sensitive and marginally economical areas.

Background
The area of high-speed drillbit development has progressed steadily. It is recognized that a suitable downhole motor will be necessary to fully develop the capabilities of these bits. High-speed drilling holds the potential to reduce drilling costs and produce a smaller environmental footprint. This project will pursue the development of a suitable downhole motor.

Summary
The principal objective of this project is to design and develop a high-speed mud motor assembly compatible with a CTD system, to drill small-diameter holes for vertical, horizontal, and multilateral wells. The drilling motor assembly must contain both a conventional mud motor and an efficient gearing system to produce drillbit speeds of 10,000 rpm and match the requirements of new drillbits now under development.

To accomplish this high-speed drilling, an efficient, reliable, gearing system must be coupled to a conventional mud motor. One advantage of this coupling approach is that by changing the gear ratio, the motor may be adapted to a variety of bits and drillbit requirements. It is anticipated these bits and motors will be initially employed for small-diameter coiled tubing-drilled wells.

Phase I calls for the overall system and key components design and modeling. These components include the motor power section, gearbox, flexible coupling, seals, and bearings. A vital consideration is the reduction of vibrations caused by possible imbalances at high rotation rates; an appropriate vibration damper is to be incorporated into the design. In Phase I, the equipment required to test the motor also is to be designed. Phase II calls for the motor and the test equipment to be built to test the motor in the laboratory. These tests are to be followed by testing at industrial test facilities or test wells.

Current Status (October 2005)
The project is proceeding at or ahead of schedule. APS researchers presented the company profile, related projects, current project goals, and project status to NETL in Tulsa, OK, on March 9, 2005.

Project Start / End: 10-1-04 / 9-30-06
DOE / Performer Cost: $799,081 / $199,770
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